Experiment P-29
Sound Isolation

Physics

Objectives

- To observe through which materials sound travels better.
- To understand the concept of sound isolation.

Modules and Sensors

- PC + NeuLog application
- USB-200 module
- NUL-212 Sound logger sensor

Equipment and Accessories

▪ Audio device (or other steady sound source)
▪ Sound isolation sponge
▪ Felt
▪ Paper towels
▪ Sound isolation box
▪ Egg tray

- The items above (except for the audio device) are included in the NeuLog Sound kit, SND-KIT

Introduction

Acoustic or sound isolation refers to technologies with materials and techniques developed to attenuate and/or isolate the level of sounds in a given space.

Isolation is the prevention of a sound from penetrating or leaving a media. Isolation is achieved by using both absorbent and isolating materials. When an acoustic wave influences a constructive element, part of the energy is reflected, another part is absorbed and the rest is transmitted to the other side. The element offers isolation which is the difference between the incident and the transmitted energy. In order to acquire a good acoustic isolation various basic factors must be involved:

- **Mass factor**. Acoustic isolation is acquired mainly by the mass of the constructive elements: the larger the mass, the greater resistance opposes the bumping of the sound waves and the greater the attenuation.

- **Multilayer factor**. When dealing with constructive elements formed by many layers, a suitable arrangement of the layers can give a better acoustic isolation even to higher levels than the isolation that can be reached by the sum of each individual layer.

- **Dissipation factor**. Isolation is also better if an absorbent material is put between the two layers.

In this activity we will use a sound sensor to measure different sound levels and study which materials are better isolators.

Procedure

Experiment setup

1. Assemble a system like the one in the picture bellow.

2. Put the sound sensor on the table in front of the sound source. Try to predict which materials will isolate sound better. Note that the sensor has an opening on the top through which sound is sensed.

Sensor setup

3. Connect the USB-200 module  to the PC.

4. Check that the sound sensor  is connected to the USB-200 module.

Note:

The following software functions are explained in short. It is recommended to practice the NeuLog application functions (as described in the user manual) beforehand.

5. Run the NeuLog application and check that the sound sensor is identified.

Settings

6. Click on the **On-line Experiment** icon  in the NeuLog main icon bar.

7. Click on the **Sensor's Module** box.

8. Click on the **Range** button.

9. Select the Level button to change the sensor's mode.

10. Close the **Module setup** dialog box.

11. Click on the **Experiment Setup** icon  and set the:

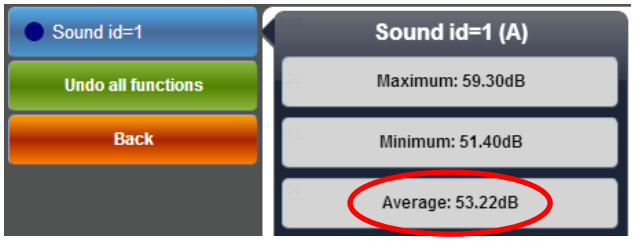
    Experiment duration to 10 seconds
    Sampling rate to 10 per second

Testing and measurements

12. Turn on the audio device or other sound source without placing an isolating material.

13. Click on the **Run Experiment** icon  to start the measurement.

14. Click on the **Show Functions** icon  , and then click on the sound button on the left of the screen.

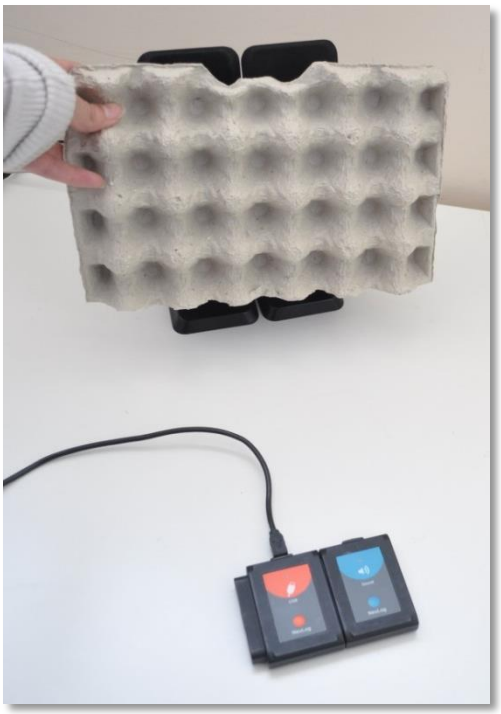


15. Write the average sound level in the following table (below the sample data):

Sample experiment	
Isolating material	**Average sound level [dB]**
No isolating material	69.9
Sound isolation sponge	69.7
Felt	69.37
Egg tray	66.39

Isolating material	**Average sound level [dB]**
No isolating material	
Sound isolation sponge	
Felt	
Egg tray	
Paper towels	
Sound isolation box	

16. Repeat the measurement placing an isolating material in front of the sound source and write the average sound level in the table. Continue in the same way with other isolating materials. Which material influences the most on the sound level?



Challenge research

17. Place two materials together as two layers in front of the audio device.

Summary questions

1. How good were your predictions about the efficiency of the sound isolators?

2. Which material is a good isolator?

3. Which material is a bad isolator?

4. What combination of isolators was the best?

5. Can you explain why certain materials are better isolators than others?